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(54) HEAT EXCHANGER

(71) We, SULZER BROTHERS LIMITED, a Company organised under the laws of Switzerland, of Winterthur, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a heat exchanger, more particularly for ventilation systems, the exchanger comprising stacked corrugated elements which are separated from one another by intermediate walls and which are disposed with the corrugations of alternate elements extending transverse to one another.

With heat exchangers of this kind, considerable difficulty is involved in sealing the discrete elements or layers to the intermediate walls and to be separate from one another. Such sealing may be provided by the introduction of sealing pastes or adhesives, but this is time consuming and expensive. It is therefore an object of the invention to simplify the production of such heat exchangers, more particularly as regards the cost of sealing the discrete layers.

Accordingly the present invention provides a heat exchanger comprising a plurality of layers each of which layers comprises a corrugated sheet element and a generally flat intermediate wall separating the corrugated sheet of the layer from the corrugated sheet of the previous layer, the corrugated elements of alternate layers being disposed with their corrugations transverse to one another, the intermediate walls being formed at each of two opposed edges which extend parallel with the corrugations of their associated sheet elements with an upstanding flange which is folded over onto the remote surface of a respective one of two opposed inflanged edges of the intermediate wall of the succeeding layer beyond the corrugated element of that succeeding layer.

Preferably, said corrugated sheet elements are formed from modular strips each having a given modular width and each having a length corresponding to an integral multiple of said modular width. This means that, provided the dimensions of each layer are integral multiples of the module, only a single tool is needed to produce the corrugated layers for different sizes of rectangular or square heat exchangers.

In order to promote a fuller understanding of the above and other aspects of the present invention, an embodiment will now be described with reference to the accompanying drawing, the single Figure of which is a diagrammatic perspective view of steps in the construction of a heat exchanger.

The heat exchanger shown in the drawing is constructed from discrete corrugated layers 1 made up by corrugated strip-like elements 2, 3 and an intermediate wall 4, the corrugated elements 2, 3 having a module width M. The corrugated elements 2 and 3 are made of metal foil, preferably commercially available aluminium foil, of a thickness of from approximately 0.05 to approximately 0.25 mm, the foil being processed to form the corrugations in known manner *per se*.

Whereas the length of the elements 2, 3 determines the edge length of the layer 1 in one direction, the edge length of the layer 1 in the other direction is determined by the use of one or two or more strips of module width M, the strips being placed side by side when two or more are used. The module M should therefore be small, e.g. 10 cm, to give flexibility so that a single module can be used to cover a large number of overall edge lengths. Also of course, in the construction of the layer 1 as shown, the edge length in each direction must be an integral multiple of the module, although the multiple need not be the same in the two edge directions.

It is not essential for the corrugations of the discrete elements 2, 3 to be in alignment with one another across the length of the layer; indeed, arranging the discrete strips of a layer 1 irregularly in relation to one another provides the advantage that the boundary layer of the flow between the corrugated walls is interrupted, with a consequent improvement in heat transfer.

The elements 2, 3 in alternate layers are disposed with their corrugations at 90° to one another.

The intermediate walls 4 are formed from sheet metal, and made from a sheet which is wider than the sum of the modules M of the elements 2, 3 and folded up with a flange 5 at each side edge which runs parallel to the corrugations of the elements 2, 3.

In the construction of the heat exchanger the flanges 5 of a wall 4 are placed around the elements 2, 3 of a layer and around the width of the intermediate wall 4 of the next length, the length of the latter corresponding to the edge length of the heat exchanger. The layer 1 which has been thus enveloped on two opposite edges and which is formed by a set of elements 2, 3 and a wall 4, then has placed on it as the next layer 1 another wall 4 followed by two elements disposed at 90° to those below. The complete heat exchanger is built up in this way layer by layer until it is of the required height; finally, it has placed around it, if required, a supporting frame (not shown).

In the construction disclosed the flanges 5 of each intermediate wall 4 are pressed or folded by the strips 2, 3 of the next layer 1 down onto the upper surface of the intermediate wall 4 of the next layer as illustrated in the drawing; the result is that the discrete layers are sealed off from one another by the flanges 5 of the walls 4, in a simple manner which, although not giving absolute sealing tightness, is adequate for most purposes, more particularly for air conditioning, and without any need for an extra working step involving introducing a sealing compound between the discrete layers.

WHAT WE CLAIM IS

1. A heat exchanger comprising a plurality of layers each of which layers comprises a corrugated sheet element and a generally flat intermediate wall separating the corrugated sheet of the layer from the corrugated sheet of the previous layer, the corrugated elements of alternate layers being disposed with their corrugations transverse to one another, the intermediate walls being formed at each of two opposed edges which extend parallel with the corrugations of their associated sheet elements with an upstanding flange which is folded over onto the remote surface of a respective one of two opposed inflanged edges of the intermediate wall of the succeeding layer beyond the corrugated element of that succeeding layer.

2. A heat exchanger as claimed in Claim 1, wherein said corrugated sheet elements are formed from modular strips each having a given modular width and each having a length corresponding to an integral multiple of said modular width.

3. A heat exchanger as claimed in Claim 2, wherein said modular width runs parallel to the corrugations of the element.

4. A heat exchanger substantially as herein described with reference to the accompanying drawings.

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1556315 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*